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<p>(21) International Application Number: PCT/US92/02852 (22) International Filing Date: 8 April 1992 (08.04.92) (30) Priority data: 695,183 3 May 1991 (03.05.91) US (71) Applicant: VELCRO INDUSTRIES B.V. [NL/NL]; HOEKENRODE 6, NL-1102 BR Amsterdam (NL). (72) Inventor: BANFIELD, Donald, L. ; 52 Bonnie Heights, Hudson, NH 03051 (US). (74) Agents: SOLOWAY, Norman, P. et al.; Hayes, Soloway, Hennessey & Hage, 175 Canal Street, Manchester, NH 03101-2335 (US).</p>		<p>(81) Designated States: AT (European patent), BE (European patent), CA, CH (European patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GB (European patent), GR (European patent), IT (European patent), JP, LU (European patent), MC (European patent), NL (European patent), SE (European patent). Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>
<p>(54) Title: INSERT MOLD-IN</p> <div data-bbox="267 1123 1356 1690"> </div> <p>(57) Abstract</p> <p>A fastener of the hook and loop type intended to be incorporated into plastic articles by plastic molding processes is formed of a known separable fastener member (1) having a base member and a plurality of engaging elements upstanding from one surface thereof. A covering (7) which intimately surrounds the individual engaging elements (2) protects the elements when exposed to the harsh environment of a molding process. This protecting covering is removable from the fastener after the molding process to expose the engaging elements without substantially destroying the performance thereof.</p>		

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INSERT MOLD-INBACKGROUND OF THE INVENTION

This invention relates to an improved device and method for adapting separable fasteners, particularly those of the hook and loop type, for attachment to other objects such as poly(urethane) foam seat cushions or hard plastic parts for automobiles, furniture and the like. In this method one portion of a separable fastener is incorporated into the plastic object during the molding process for subsequent attachment to another object carrying the mating portion of the separable fastener. The fastener of this invention provides a greater degree of design flexibility as to the shape and especially as to types of plastic into which the part may be molded.

DESCRIPTION OF THE PRIOR ART

Hook and loop separable fasteners, such as those sold by the assignee of this application under the trademark "VELCRO" are well known and used to join two members detachably to each other. This type fastener has two components. Each has a flexible substrate or base having one component of the fastening system on the surface thereof. One surface is typically comprised of resilient hooks while the other is comprised of loops. When the two surfaces are pressed together they interlock to form a releasable engagement. Separable fasteners have in recent years been used in the manufacture of automobile seats in the attachment of an upholstered seat cover, hereinafter called trim cover, to a poly(urethane) foam bun. One portion of the separable fastener is incorporated into the surface of the poly(urethane) seat bun during the foam molding process. The mating portion of the separable fastener is attached to the seat cover to provide releasable attachment to the foam seat bun. The separable fastener assembly used in the foam mold for incorporation in the bun surface typically comprises the hooked portion

1 of the separable fastener system. This hook portion is
2 characterized by a base carrying resilient hooks on one
3 surface. The outer surface of the base may act as an
4 anchoring surface by a variety of methods well known in
5 the art. In some assemblies a magnetizable shim is
6 attached to the base to facilitate placement of the
7 assembly in a trough of the mold cavity wall, which is
8 equipped with magnets. A protective layer, usually in the
9 form of a thin plastic film, is placed over the resilient
10 hooks to prevent incursion of foam into the hooks during
11 the molding process. Significant foam contamination of
12 the hooks would affect their ability to engage with the
13 mating portion of the fastener. Such fastening devices
14 are applied to one surface of a clamshell mold; a chemical
15 mixture, usually of a diisocyanate and a polyol, are
16 injected into a mold; the upper surface of the mold is
17 closed and clamped shut while the chemicals react and blow
18 to form a flexible foam, well known in the art. The
19 present state of the art relating to the attachment of
20 such fastener means to foamed seat cushions and the like
21 is generally represented by French patents 2,405,123 and
22 2,423,666 as well as the following U.S. patents:

23 Patent Number 4,470,857, issued September 11, 1984 in
24 the name of Stephen J. Casalou and assigned to R.A.
25 Casalou, Inc.;

26 Patent Number 4,563,380, issued January 7, 1986 in the
27 name of Philip D. Black and assigned to Minnesota Mining
28 and Manufacturing Company;

29 Patent Number 4,673,542, issued June 16, 1987 in the
30 name of Lauren R. Wigner and assigned to General Motors
31 Corporation;

32 Patent Number 4,693,921, issued September 15, 1987 in
33 the name of Patrick J. Billarant and Bruno Queval and
34 assigned to Aplix;

35 Patent Number 4,710,414, issued December 1, 1987 in
36 the name of Walter E. Northup and Maurice E. Freeman and
37 assigned to Minnesota Mining and Manufacturing Company;

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1 Patent Number 4,726,975, issued February 23, 1988 in
2 the name of Richard N. Hatch and assigned to Actief N.V.
3 ABN Trust Co.; and

4 U.S. Patent Number 4,842,916 issued June 27, 1989 to
5 Kunihiro Ogawa et al assigned to Kuraray Company Ltd.,
6 Kurashiki, Japan.

7 Such mold-in separable fastener assemblies presently
8 in use, while proving to be superior means of attaching a
9 seat cover to a foam bun, have limitations. One
10 disadvantage of the separable fastener assemblies of the
11 type disclosed in U.S. Patent No. 4,673,542 is that the
12 thin plastic film layer used to cover the hooks is light
13 and flimsy thus limiting the degree of protection offered
14 to the hooks against high pressure or temperature. Such
15 devices are therefor unable to be used for molding hooks
16 into hard plastic using a standard injection molding
17 machine where the high temperature of the molten plastic
18 has a tendency to melt the hooks or the high pressure of
19 the plastic during the injection process is capable of
20 crushing the hooks.

21 Other prior-art assemblies, including those disclosed
22 in U.S. Patents No. 4,726,975, 4,563,380 and 4,693,921
23 also employ a thin layer of film to prevent the incursion
24 of foam into the fastener elements of the separable
25 fastener during molding. French Patent 2,423,666
26 discloses a system for sealing the edges of the tape in
27 the mold trough by jamming the edges of the fastener into
28 the trough. None of these methods provides protection for
29 the hooks against high temperature or pressure which will
30 destroy hooks during the molding operation. U.S. Patent
31 No. 4,562,032 incorporates a soft lining as an integral
32 portion of the mold cavity surface to protect the grain of
33 a thin grained face of a vinyl sheet but the patent
34 literature is generally devoid of teachings which protect
35 large protuberances on plastic mold inserts from the
36 rigors of the injection or compression molding process.

1 In fact the patent literature repeatedly recommends the
2 melting temperature of the insert part be greater than the
3 processing temperature of the injecting molten polymer.
4 Such teachings are contained in U.S. Patent No. 2,643,158
5 directed to a method of molding brushes. At section 4,
6 line 60-63, "In general the materials should be selected
7 so that the strands or tufts shall not be caused to
8 deteriorate by the molding heat". Those skilled in the
9 art understand it is not advisable to insert plastic into
10 injection molds or into compression molds at temperatures
11 greater than the distortion temperature of the insert
12 part. In some cases methods are used for cooling a
13 portion of the mold containing a meltable insert. Such
14 systems are cumbersome, expensive and difficult to use.

15 U.S. Patent No. 2,293,035 describes a method of
16 combining two molded parts of different colors into one
17 article by molding the first mold piece into a removable
18 metal insert that constitutes the first part mold and
19 using the removable mold as the insert in the second mold
20 without removing the first part from the insert mold. The
21 method recommends molding the second part while the first
22 part is still warm to achieve proper bond between the
23 first and second parts. This method provides no special
24 methods of protecting the part from pressure or
25 temperature other than to retain it in its original mold.
26 It has the disadvantage that the first mold is large and
27 cumbersome because of the necessity of fitting and being
28 retained securely into the first injection molding step.

29 BRIEF SUMMARY OF THE PRESENT INVENTION

30 In the present invention there is provided a novel
31 fastener capable of being insert molded into elastomeric
32 foamed parts, such as seat buns, or into hard plastic
33 parts such as cases, using standard injection or
34 compression molding techniques without contaminating or
35 destroying the hook projections due to intrusion of
36 material onto the hooks or heat and pressure. As in the

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1 prior art products, my invention carries on one surface an
2 area of outwardly extending fastener elements, preferably
3 hooks. These fastening elements constitute one half of a
4 touch fastening system. The other half of the fastening
5 system is attached to the companion portion of the
6 intended assembly. The outwardly extending fastener
7 elements, however, are at least partially encased in an
8 elastomeric compound, more specifically described below,
9 which fills most (preferably all) of the void areas
10 surrounding and protecting the engaging elements. This
11 novel fastener appears as a sheet like structure
12 completely void of protuberances. In this form it is
13 possible to cut out strips or shaped segments from the
14 sheet which can be placed into a mold to be molded into a
15 plastic part. The elastomeric coating possess sufficient
16 resistance to compression to protect the hooks against
17 high pressures of the molding process and also provides
18 insulation against transfer of heat from the molten
19 injected plastic to melt the hooks of the fastener.

20 I have found it convenient to incorporate means for
21 magnetic attraction within the elastomeric coating for
22 holding the fastener against the magnets incorporated into
23 the walls of the mold as is well known in the art. Such
24 materials as iron filings or iron oxide or carbon steel
25 strips are suitable for such purposes.

26 In this way is provided a fastener which is capable of
27 withstanding the rigors of the most severe molding
28 processes, such as injection or compression molding, at
29 temperatures greater than the distortion temperature of
30 the polymer forming the insert part.

31 After molding the elastomeric protective cover is
32 removed from the fastener elements exposing the hooks.
33 The protective cover, being elastic, is capable of being
34 removed by several means. In its simplest form removal is
35 achieved by simply yanking or pulling upon the sheet
36 formed by the elastomeric compound. The elastomeric sheet

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1 is of such integrity and elasticity it can be pulled away
2 from the hooks without distorting them or without breaking
3 itself.

4 Other methods of removal are possible including
5 injecting air through a needle inserted through the
6 elastomeric protective coating to lift the coating off the
7 engaging elements through pressure built up under the
8 coating. In any event the exposed hooks at this point
9 form an integral part of the plastic piece.

10 The companion portion of the assembly, containing on
11 its inner surface companion fastening elements, loops for
12 example, is affixed to the part by means of the
13 incorporated mating elements. The hook and loop closure
14 firmly holds the two components together providing a
15 detachable means for combining the sections of the
16 assemblage.

17 The fastener of this invention is also usable in
18 molding situations such as the cold molding of urethane
19 seat buns. It is convenient to apply the protective
20 coating to the fastener material in wide sheets using
21 coating or calendering techniques well known in the art.
22 It is then possible to slit the wide product into long
23 narrow strips which substitute readily for the more
24 conventional well known strip fasteners molded into seat
25 buns for attachment of trim covers to form a completed
26 seat assembly. To create special shapes of fastener,
27 desirable for more intricate designs in the seat I cut the
28 wide sheet into various shapes, such as curves, chevrons,
29 wings and the like, using methods well known such as
30 rotary or steel rule dies.

31 BRIEF DESCRIPTION OF THE DRAWINGS

32 In order to more fully understand the invention,
33 reference is made to the following detailed drawings.

34 Figure 1 is a cross section view of a hook fastener
35 section of a hook and loop fastener closure.

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1 Figure 2 is a cross section view of the fastener of
2 Figure 1 encased in the protective medium to create the
3 product of the present invention.

4 Figure 3 is a cross section view of the protected
5 closure portion of this invention placed in an injection
6 mold with the mold faces apart.

7 Figure 4 is another cross sectional view of the mold
8 of Figure 3 but with the faces of the mold closed and
9 receiving molten plastic from the injector screw.

10 Figure 5 is a view of the mold of Figure 3 and 4 but
11 with the mold once again opened and ready to discharge the
12 molded part now containing the inserted part.

13 Figure 6 is a cross section view of the molded plastic
14 part showing the removal of the elastomeric protector from
15 the hook portion of the part.

16 Figure 7 is a cross section of a completed plastic
17 part produced from the mold of Figure 3.

18 Figure 8 through Figure 10 depict the same sequence as
19 Figure 3 through Figure 5 but for a compression mold
20 machine rather than by injection molding.

21 Figure 11 shows a method of applying the elastomeric
22 compound to the hook tape to encase the hooks for
23 protection from high pressures and temperatures during the
24 molding process.

25 Figure 12 shows an alternative method of applying the
26 protective coating to the hook strip.

27 DETAILED DESCRIPTION

28 Figure 1 is a cross-sectional view of the two portions
29 of a standard hook and loop tape 1 where the two portions
30 are not engaged. Base 4 supports upstanding hooks 2 and
31 loops 3. As the two portions are pressed together the
32 hooks 2 penetrate loops 3 to releasably engage each side
33 of the fastener. Backing 6 has been added to base 4 to
34 serve as a tie layer for molding the fastener 1 into other
35 objects such as plastic parts or elastomeric seat buns.
36 Loops 3 and hooks 2 are customarily made from

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1 thermoplastic polymeric resins which are heat set to
2 resiliently retain their shape during multiple openings
3 and closings of the fastener. If the thermoplastic hooks
4 or loops are subjected to high temperatures and/or high
5 pressures the elements 2 or 3 will be crushed and rendered
6 inoperable. If the temperature is raised near the
7 softening point of the thermoplastic resin forming the
8 fastener elements, the elements will distort or even melt
9 if the temperature is sufficiently high. If at the same
10 time great pressure is applied to the softened elements
11 the entire assembly is crushed and the function of the
12 fastener is destroyed.

13 A typical environment wherein such temperatures and
14 pressures are encountered is in plastic molding such as
15 injection molding, compression molding, casting, slush
16 molding, powder molding, transfer molding, rotational
17 molding and the like. Heretofore, it is not known to
18 mold-in hook and loop fasteners directly into plastic
19 parts using such methods because the molding process
20 destroys the fastener elements.

21 Figure 2 depicts a cross sectional view of the product
22 of this invention wherein the above mentioned difficulties
23 have been overcome by encasing the fastener elements 2 in
24 an elastomeric coating 7 which completely surrounds the
25 elements 2.

26 The elastomeric protection encasing the elements 2 can
27 be selected from a wide variety of materials which operate
28 to encapsulate and prevent contamination or destruction of
29 the hook or loop projections during a rigorous plastic
30 molding operation, while at the same time affording a
31 coating that can be easily applied and removed from the
32 projections without damage to their ultimate function as a
33 separable fastener assembly.

34 Accordingly, elastomers are selected which have an
35 initial application viscosity that facilitates the
36 diffusion and penetration of the elastomer resin into the

1 tiny irregularities of a hook and loop fastener. Both
2 solvent cast and two-component curing elastomer systems
3 are broadly contemplated, wherein the application
4 viscosity of the former can be conveniently adjusted by
5 controlling the weight percent of solid elastomer
6 contained within a particular solvent system.

7 In the preferred embodiment of a two-component curing
8 elastomer system, the individual liquid component
9 viscosity becomes an important consideration for selecting
10 the particular reactive combination. Accordingly, the
11 uncured liquid components must combine to provide an
12 application viscosity that first penetrates and
13 encapsulate a fastener element, prior to eventual curing
14 and formation of a solid encapsulating elastomeric medium.

15 Yet a further criterion for selection of the
16 elastomers of the instant invention is to include those
17 elastomers that are effective to keep molten or liquid
18 plastic out of the fastener elements during a particular
19 molding cycle yet also can avoid becoming permanently
20 bound to the surface of the hooks or loops so that their
21 removal might result in destruction of the fastener
22 assembly. In connection with this objective, elastomers
23 are selected which are known to be relatively unable to
24 permanently adhere to the surface of a particular fastener
25 element that they are then acting to encapsulate. It will
26 also be appreciated that various additives can be combined
27 with a particular elastomer so as to further minimize
28 permanent bonding of the surface of the fastener with a
29 particular encapsulating material.

30 Alternatively, in yet another broad aspect of this
31 invention, the surface of the particular fastener may be
32 treated with a release agent prior to being coated with an
33 elastomer resin, which then facilitates the removal of the
34 elastomer after the plastic molding cycle is complete.
35 Furthermore, it will be appreciated that additives may be
36 incorporated directly into the various materials employed

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1 to produce the fasteners themselves, which would also
2 contribute to a reduction in the bonding between the
3 fastener surface and the encapsulating resin.

4 Those elastomers that are particularly suited to reach
5 the above objectives include silicone rubbers, but other
6 suitable materials include, when properly compounded,
7 natural rubber, urethane rubbers, or other elastomers well
8 known in the trade. When properly applied onto a hook and
9 loop fastener 1 the elastomer encases the elements 2 (or
10 3) around all sides and effectively holds the element 2 in
11 place with respect to its base 4 and adjacent hooks 2.
12 The encapsulating elastomer 7 acts as both a seal to keep
13 molten or liquid plastic out of the hooks 2 or loops 3
14 during the molding cycle, and as a compression stay to
15 cushion the hooks from the extreme pressures associated
16 with plastic molding cycles, and as an insulation barrier
17 from any heat distortion or melting.

18 Figure 3 is a cross section view of a simple injection
19 mold 8 showing cavity plate 9 and core plate 10 in the
20 open position. Fastener 5 is inserted into a section of
21 the core plate and held thereon by a magnet 13 which is
22 made an integral part of the mold 8. To assure attraction
23 between the magnet 13 and the fastener 5, elastomeric
24 coating 7 contains, in addition to the elastomeric
25 compound, iron particles that will be attracted to the
26 magnet 13 and hold the fastener 5 in the desired location.
27 Figure 4 is a cross section representation of the mold 8
28 in the closed position where plastic has been injected
29 into the cavity 9 through opening 11 to create the
30 impression 12. Figure 5 shows the next step in the
31 molding process wherein the mold 8 is opened after the
32 injected plastic has had time to solidify. At this point
33 the part would be ejected from the mold 8. Figure 6
34 depicts the step of removing the elastomeric protector 7
35 from the plastic part 12 to uncover fastening elements 2
36 or 3. Figure 7 illustrates a cross section of the final

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1 piece 12 with hooks 2 aligned to receive loops from a
2 companion piece (not shown) to detachably connect the
3 assembly. The fastening elements are unaffected by the
4 severe environment within the mold cavity and are in
5 condition to perform their fastening function when joined
6 together with the companion loop elements.

7 Figure 8 through Figure 10 depict the molding sequence
8 involved in the compression molding process using the
9 fastener of this invention. In Figure 8, the protected
10 fastener 5 has been attached to the mold 15 by magnet 13.
11 A polymer slug 14 is charged to the mold 15 and the upper
12 portion of the mold 16 closes against the slug 14 causing
13 it to melt and flow into the unoccupied portions of the
14 mold cavity. Figure 10 illustrates the next step in the
15 compression molding process whereby the mold 15 is opened
16 exposing the piece 12 which is subsequently removed from
17 the mold 15. The finished piece contains the fastener 5,
18 with the elastomeric protector 7 still in place,
19 integrally contained as a part of the finished molded
20 piece 12. The elastomeric protector 7 is removed as shown
21 in Figure 6 and the part 12 is represented, as in the case
22 of injection molding, by Figure 7.

23 Figure 11 illustrates the use of my invention in a
24 liquid molding process, such as is used for the
25 manufacture of elastomeric seat buns for automobiles,
26 wherein the plastic piece 18 (see Figure 13) is formed by
27 pouring reactive chemicals 17, such as polyol and
28 diisocyanate, into a mold 16 and permitting the parts to
29 react to form a solid foam object 18. Mold 16 is charged
30 with an appropriate chemical mixture 17, well known in the
31 art, covering a fastener element 1 possessing a protective
32 cover 7. The fastener is held in the mold by magnetic
33 attraction of a magnet 13 imbedded in the mold 16 upon
34 iron particles incorporated into the protective coating,
35 as described above. Figure 12 shows the mold 16 after the
36 chemicals 17 have reacted and filled the mold 16 to form

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1 the plastic part 18. Figure 13 shows the finished part
2 18, for example a seat bun, with the fastener 1 positioned
3 in place and integrally molded therein, after the
4 protective covering 7 has been removed. It will be
5 understood by those skilled in the art that in like manner
6 any other method of forming plastic parts could be used to
7 incorporate a hook and loop fastener into a solid flexible
8 plastic part.

9 It can be readily appreciated by the foregoing
10 discussion the essence of my invention is the application
11 of the elastomeric coating into the engaging elements.
12 Both the nature of the elastomeric compound and the method
13 of application are important considerations in creating
14 this novel fastener. Figure 14 illustrates a method of
15 applying a liquid composition 5 to the fastener elements
16 of the instant invention. The fastener tape 1 is passed
17 under the knife of a knife coater 19, well known in the
18 art. The elastomeric compound 5 is evenly spread over and
19 throughout the fastener elements 2. A compound composed
20 of Silastic E, a two part room temperature vulcanizing
21 silicone mixture sold by the Dow Corning Company, is
22 ideally suited for application in this manner. After
23 applying the liquid compound it is dried in an oven at
24 150°F (65.6°C) for 30 minutes. The fastener thus treated
25 has a rubbery material completely encapsulating the
26 fastening elements. A sheet of the coating has a tensile
27 strength of 700 psi (49.215 kg./sq. cm.) and an elongation
28 of 400%. Other materials which are also well suited to
29 this method of application include Conap Conathane
30 (TU4011) a two part urethane mixture and Vinyl Plastisol
31 (CS8-1303A) sold by Coating Systems, Inc. To each of
32 these materials was added 25% by weight of Bayflex 316
33 iron oxide powder as the ferromagnetic material to cause
34 attraction to the magnet incorporated in the wall of the
35 mold. Figure 15 illustrates a second method of applying
36 an elastomeric coating to the fastener material to create

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1 the product of this invention. Calender coating is well
2 known in the art and I have found it useful for the
3 purposes of coating hook and loop materials. The uncoated
4 fastener 1 is passed between calender rolls 20. An
5 elastomeric compound 7 is applied into the nip 21 formed
6 between the rolls 20. The elastomeric compound is evenly
7 distributed throughout the engaging elements 2. The
8 combination thus formed is cured in a manner appropriate
9 for the specific compound used which will be more
10 specifically understood by referring to the examples set
11 forth below.

12 The resulting products are suitable for inclusion in
13 injection molds by attaching to the magnet incorporated in
14 the walls thereof and capable of withstanding the high
15 temperatures and pressures of the molding process.

16 DESCRIPTION OF THE PREFERRED EMBODIMENT

17 The following examples will be illustrative of the
18 execution of the method for manufacturing and use of the
19 product of this invention.

20 EXAMPLE I

21 A length of the plastic hook portion of a hook and
22 loop closure designated as Ultra-mate HTH 708 is extruded
23 as described in U.S. Fisher Patent 4,794,028. The
24 resultant poly(propylene) layer containing about 750
25 hooks/in² (750 hooks/6.45 cm²) was coated in a laboratory
26 coater using Dow Corning Silistic E two part room
27 temperature vulcanizing (RTV) silicone mixed in a 10:1
28 ratio of part "A" with part "B" as recommended by the
29 chemical manufacturer. 25% by weight of Mobay Bayferrox
30 316 was added to the silicone mixture. The knife of the
31 coater was set to a gap of 0.010" (0.0254 cm) above the
32 top surface of the hooks of the fastener tape for applying
33 a first coating to the tape. The knife gap was adjusted
34 to 0.025" (0.0635 cm) above the top surface of the hooks
35 to render the second coating smooth and more evenly
36 distributed throughout the hooks. The coated tape was .

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1 placed in a convection oven at 140°F (122.2°C) for 30
2 minutes. After removing from the oven and permitting to
3 cool it was observed the silicone coating was easily
4 removed from the hook elements with no noticeable
5 distortion or diminution of their fastening ability. A
6 sample, prepared as described, was cut into a section 1"
7 by 1" (2.54 cm by 2.54 cm), and inserted into a recess of
8 the same size cut to accommodate the fastener, in a plaque
9 mold 1" by 4" (2.54 cm by 10.16 cm). A Zytel (nylon)
10 injection grade plastic, sold by the Dupont Company, was
11 injected into the mold at a nozzle temperature of 525°F
12 (273.9°C) for 3 seconds at a pressure of 7000 psi (492.15
13 kg./sq. cm.) with a hold time of 45 seconds. The plastic
14 plaque thus formed was removed from the mold and the
15 silicone coating on the fastener was mechanically pulled
16 from the piece to expose the hooks. No damage to the hook
17 could be observed.

18 EXAMPLE II

19 A length of the plastic hook portion of a hook and
20 loop closure, designated as Ultra-mate HTH 708
21 poly(propylene), was coated in a laboratory coater using
22 Dow Corning Silistic E, a two part room temperature
23 vulcanizing (RTV) silicone mixed in a ratio of 10:1 as
24 described above. 25% by weight of Mobay Bayferrox 316
25 iron oxide powder was added to the silicone mixture.
26 Coating proceeded as in example I. A sample cut into a
27 section 1" by 1" (2.54 cm by 2.54 cm), was inserted into a
28 recess of the same size cut to accommodate the fastener,
29 into a plaque mold 1" by 4" (2.54 cm by 10.16 cm). A
30 poly(propylene) injection grade plastic, sold by the
31 Dupont Company was injected into the mold at a nozzle
32 temperature of 425°F (218.3°C) for 3 seconds at a pressure
33 of 12,000 psi (843.68 kg./sq. cm.) with a hold time of
34 about 30 seconds. the plastic plaque thus formed was
35 removed from the mold and the silicone coating on the
36 fastener was mechanically pulled from the piece to expose
37 the hooks. No damage to the hooks could be observed.

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EXAMPLE III

1
2 A plastic hook was extruded as in Example I but the
3 plastic was a polyester based elastomer, CFM Hytrel 8238,
4 sold by the Dupont Company. Laminated on the surface
5 opposite the hook elements was a rayon nonwoven fabric,
6 Pellon 850, sold by the Freudenberg Company. The fastener
7 element thus formed was calender coated using a
8 proprietary EPDM (ethylene-propylene rubber) material
9 supplied by JPS elastomers division of the JPS Corporation
10 who also carried out the calendering step. The EPDM
11 coating with the fastener strip was 0.120 inches (0.305
12 cm) thick and 12 inches (30.5 cm) wide. Samples of the
13 coated fastener were die cut into shaped pieces
14 approximately 1" (2.54 cm) wide making a smooth curve with
15 inner radius of 20 inches (50.8 cm) and a total length of
16 approximately 8 inches (20.3 cm). The part thus cut was
17 placed in a clamshell mold used to make seat buns
18 incorporating a pedestal containing a magnet on its upper
19 surface to hold the piece with the elastomeric coating
20 facing downward and in intimate contact with the top
21 surface of the pedestal. A standard charge of liquid
22 chemicals, including a diisocyanate and a polyol, were
23 introduced into the mold. The upper half of the mold was
24 closed and the chemicals allowed to react to create a foam
25 which filled the cavity of the mold. The mold was opened
26 and seat bun removed. The EPDM elastomeric covering of
27 the hooks was removed by gripping one end of the elastomer
28 and pulling the coating from the fastener. The coating
29 pulled away from the hooks of the fastener without
30 difficulty to expose the hooks. There was no noticeable
31 tendency to pull the fastener from the soft urethane foam
32 and the hooking elements were perfectly clear and free of
33 any chemical. No damage or distortion of the hooks could
34 be observed.

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CLAIMS

1
2 1. A fastener of the hook and loop type intended to
3 be incorporated into plastic articles by plastic molding
4 processes comprising a separable fastener member having a
5 base member and a plurality of engaging elements
6 upstanding from one surface thereof; means (7) for
7 covering and intimately surrounding said engaging
8 elements, adapted to protect said elements when exposed to
9 the harsh environment of a molding process, said means
10 being removable from the fastener after the molding
11 process to expose said engaging elements (2) without
12 substantially destroying the performance thereof.

13 2. The fastener according to claim 1 wherein the
14 means (7) for covering and intimately surrounding said
15 engaging elements (2) is an elastomeric precursor which
16 fills the volume surrounding the elements and can be cured
17 to an elastomer.

18 3. The fastener according to claim 2 wherein the
19 elastomeric composition for covering and intimately
20 surrounding said engaging elements (2) is selected from
21 the group consisting of curable compositions of silicone
22 rubber, natural rubber, synthetic rubber, vinyl plastisol
23 and urethane rubber cured elastomer which will not adhere
24 to the material of the engaging elements.

25 4. The fastener according to claim 1 wherein the
26 means (7) for covering and intimately surrounding the
27 engaging elements (2) includes magnetizable means (13).

28 5. The fastener according to claim 2 wherein the
29 elastomeric composition has incorporated therein a
30 magnetic attractant, preferably a ferromagnetic substance.

31 6. The fastener according to claim 5 wherein the
32 ferromagnetic substance represents at least 20% of the
33 weight of the covering.

34 7. A fastener of the hook and loop type intended to
35 be incorporated into plastic articles by plastic molding
36 processes comprising a separable fastener member having a

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1 base member and a plurality of engaging elements
2 upstanding from one surface thereof, elastomeric
3 protective means (7) covering and at least partially
4 surrounding and between said engaging elements, (2)
5 adapted to protect said elements when exposed to the harsh
6 environment of a molding process, said protective means
7 being adapted to be removed from the fastener after the
8 molding process to expose said engaging elements without
9 substantially destroying the performance of said elements.

10 8. The separable fastener of claim 7 wherein the
11 elastomeric protective means (7) which partially surrounds
12 the engaging elements is an elastomeric precursor which
13 can be applied as a flowable composition and cured to an
14 elastomer in place.

15 9. The fastener according to claim 8 wherein the
16 elastomeric composition for covering and at least
17 partially surrounding said engaging elements (2) is
18 selected from the group consisting of curable composition
19 of Silicone rubber, natural rubber, synthetic rubber and
20 urethane rubber.

21 10. The fastener according to claim 7 wherein the
22 elastomeric means for covering and at least partially
23 surrounding the upstanding elements includes magnetizable
24 means (13).

25 11. The fastener according to claim 9 wherein the
26 elastomeric composition has incorporated therein a
27 magnetic attractant, preferably a ferromagnetic substance.

28 12. The fastener according to claim 11 wherein the
29 ferromagnetic substance represents at least 20% of the
30 weight of the elastomeric protective means (7).

31 13. A method for inserting separable fasteners of the
32 hook and loop type into plastic parts comprising the steps
33 of:

34 (a) coating the fastener to cover and intimately
35 surround the engaging elements with protective
36 elastomeric means against the pressure and
37 temperature of molding elastomeric composition

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- 1 (b) inserting the coated fastener into a mold
- 2 containing means for holding the fastener
- 3 (c) injecting the mold with molten plastic
- 4 (d) opening the mold to remove the plastic part thus
- 5 formed
- 6 (e) removing the protective coating from the fastener
- 7 elements to render the elements ready to engage
- 8 elements on the companion portion of the hook and
- 9 loop fastener

10

11 14. The method of claim 13 wherein the protective
12 means is an elastomeric composition which is cured in
13 place.

14 15. The method of claim 14 wherein the elastomeric
15 composition is selected from the class of materials which
16 have an initial viscosity permitting full penetration of
17 the engaging elements and which are cureable to an
18 elastomeric film.

19 16. The method of claim 14 wherein the elastomeric
20 composition has a tensile strength of at least 500 pound
21 per square inch (35.153 kg/sq. cm.) and an elongation of
22 at least 300%.

23 17. The method of claim 13 wherein the means for
24 attaching the fastener in the mold is a magnet and the
25 protective composition contains magnetizable means,
26 preferably a ferromagnetic substance.

27 18. The method of claim 13 wherein the means for
28 holding the fastener onto the wall of the mold is a recess
29 of appropriate size to accept the fastener by snap fit.

30 19. The method of claim 13 wherein the protective
31 means is a flowable coating which is curable to a
32 protective elastomer which elastomer does not adhere to
33 said engaging elements.

34 20. The method of claim 19 wherein the protective
35 elastomer serves as a compression stay to cushion the
36 engaging elements from pressure exerted during the molding
37 cycle.

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1 21. The method of claim 19 wherein the engaging
2 elements are treated with a release agent.

3 22. The method of claim 19 wherein the engaging
4 elements contain a material which prevents adhesion of the
5 elastomer.

6 23. An intermediate product comprising a molded
7 object incorporating engaging elements of a hook and loop
8 fastener system (5), the engaging elements being
9 intimately surrounded by a removeable elastomer (7).

10 24. A final product formed by removing the elastomer
11 from the product of claim 23.

12 25. A product made by the method of claim 13.

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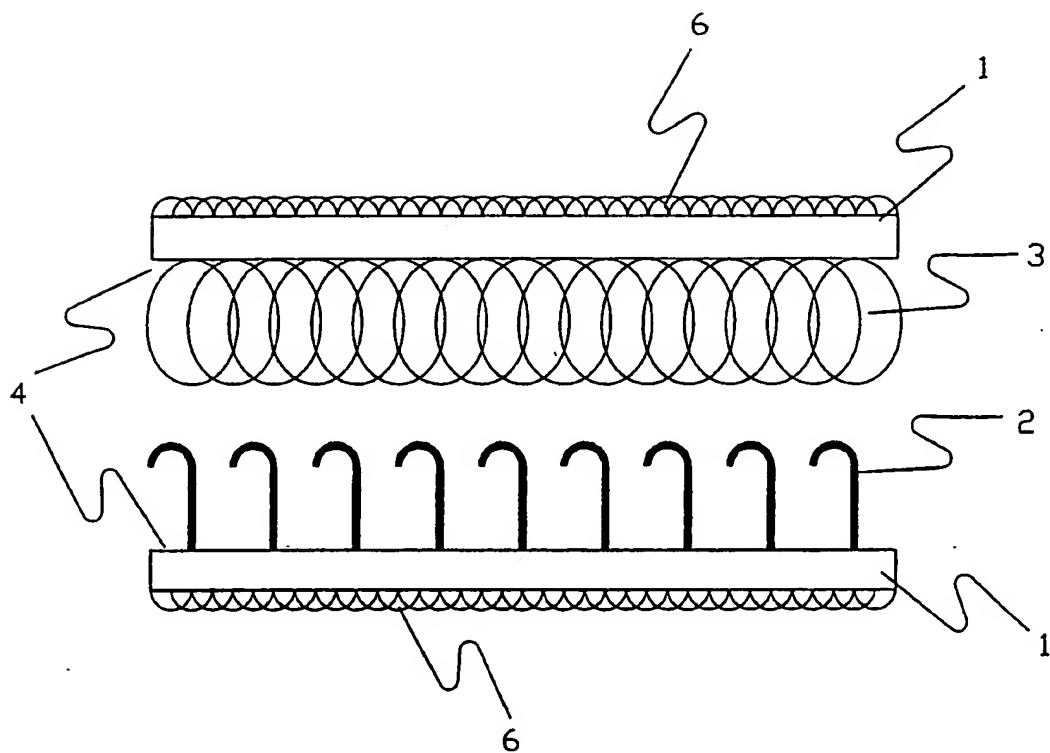


FIG. 1

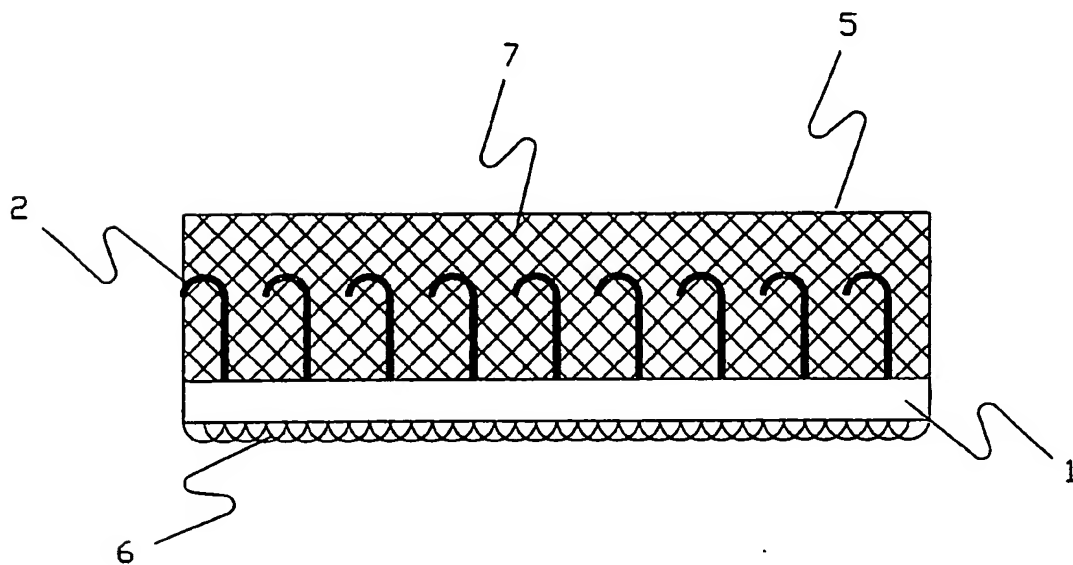


FIG. 2

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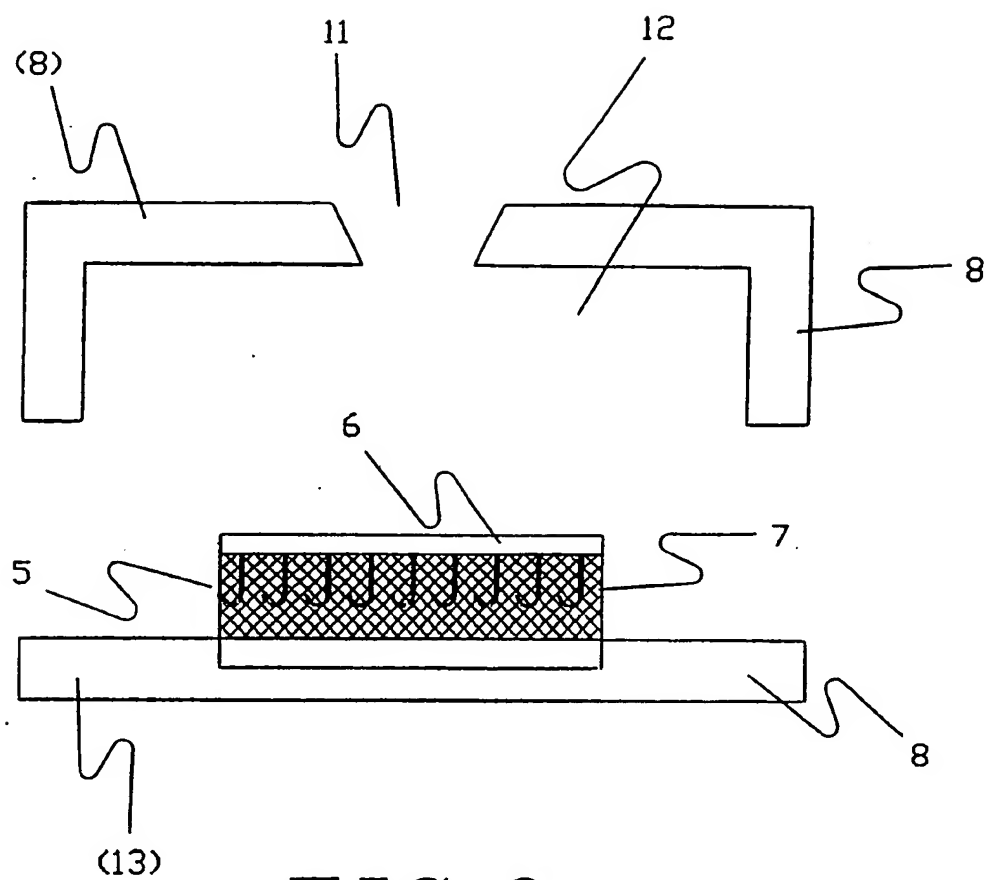


FIG. 3

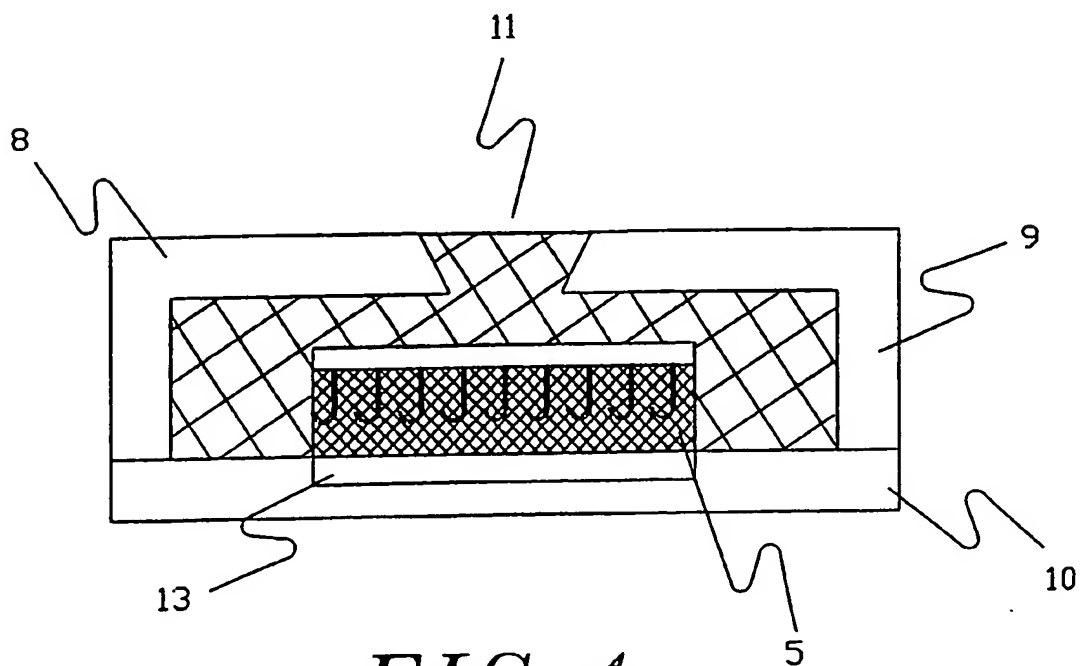


FIG. 4

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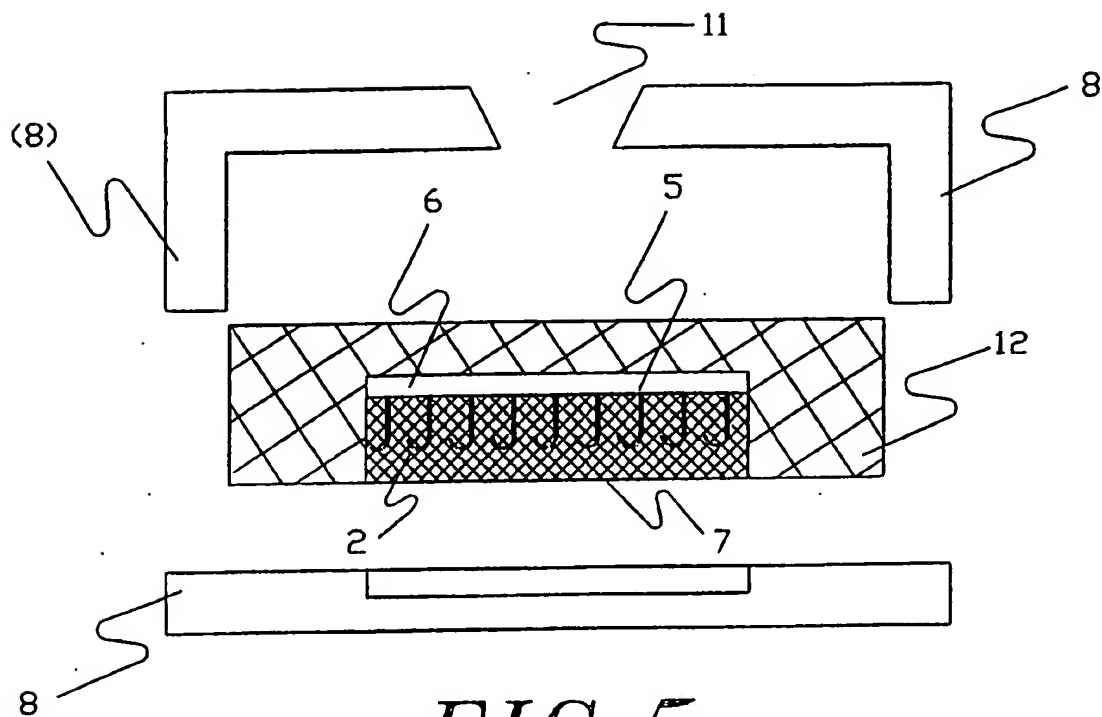


FIG. 5

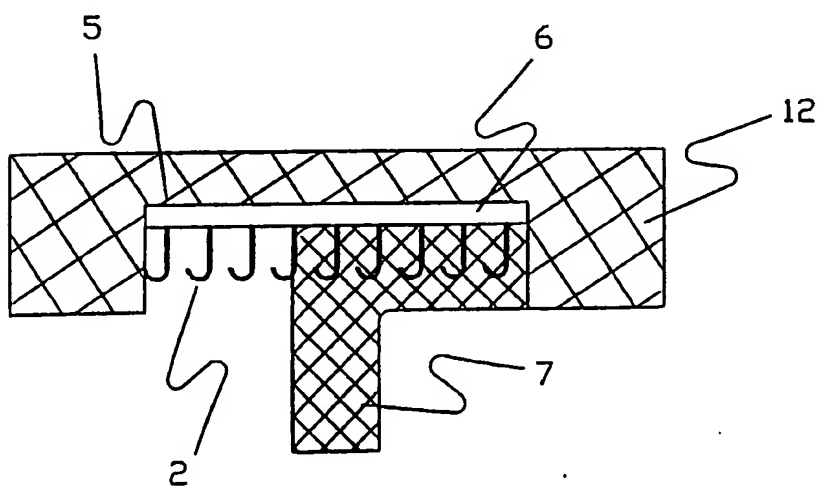


FIG. 6

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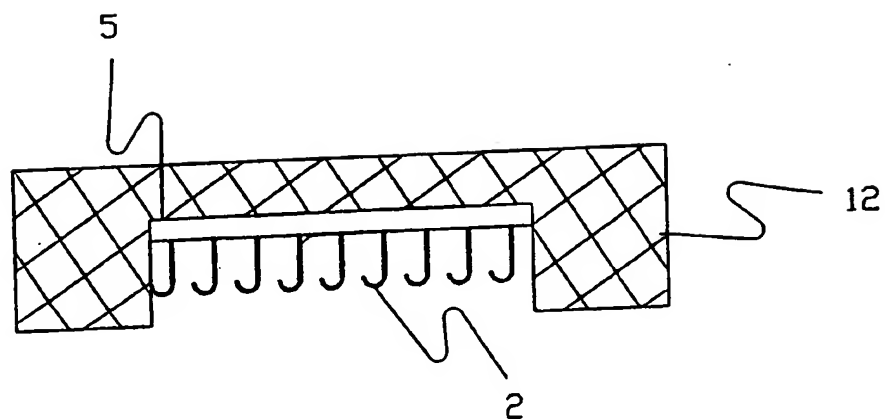


FIG. 7

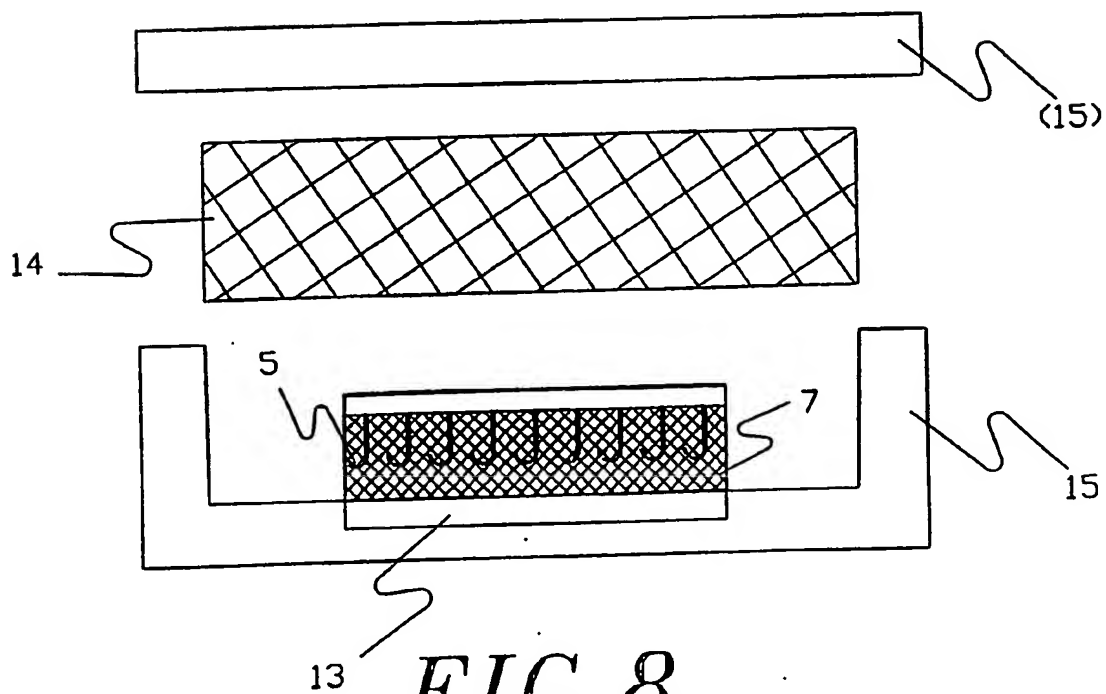
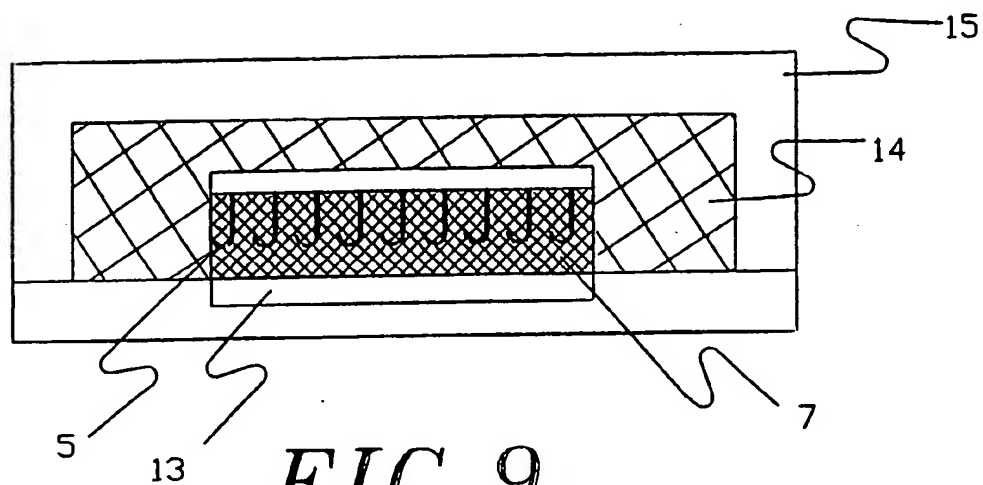
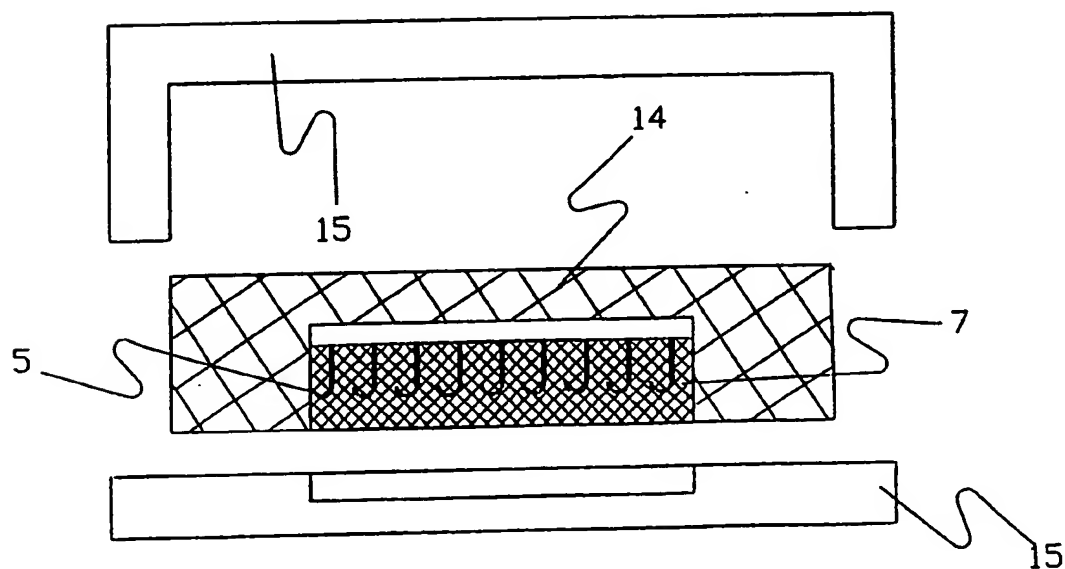


FIG. 8

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*FIG. 9**FIG. 10*

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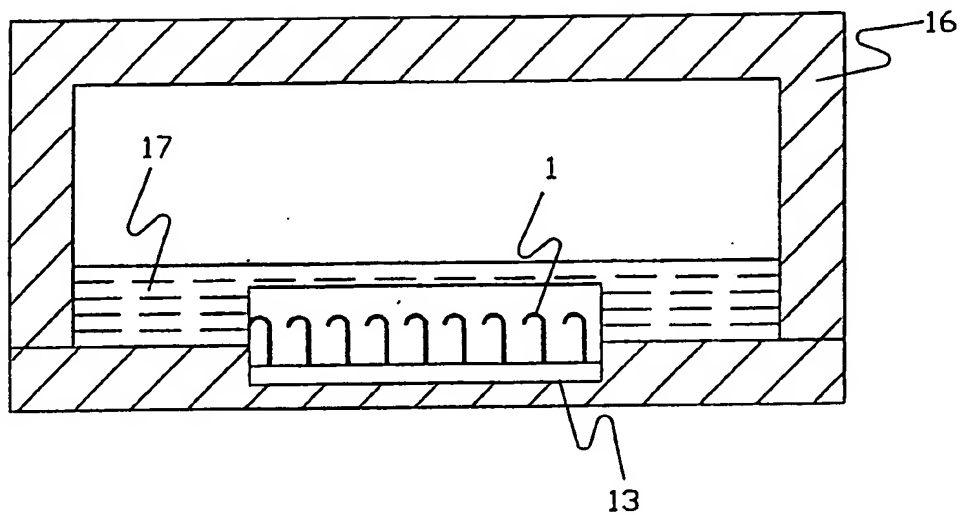


FIG. 11

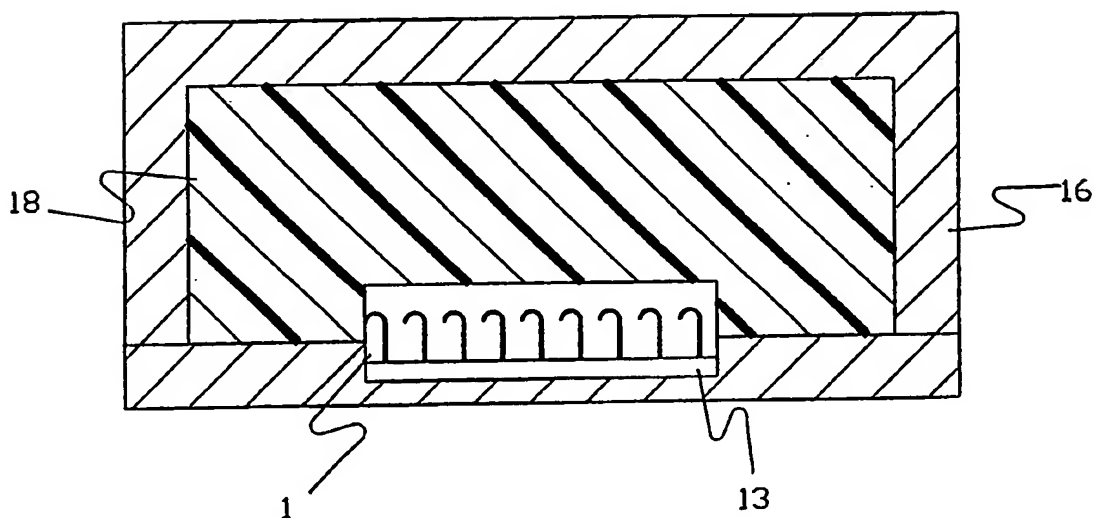


FIG. 12

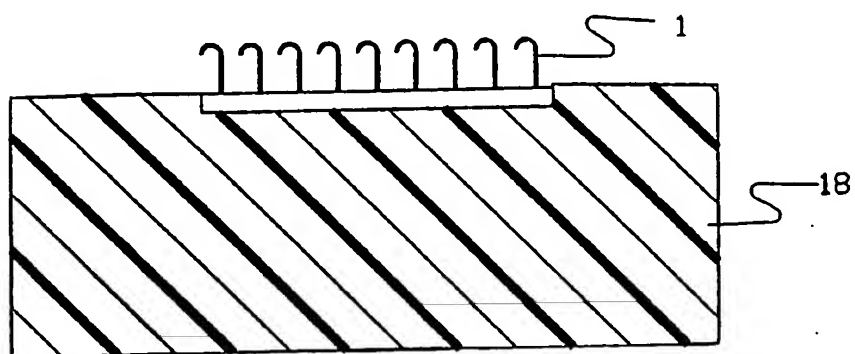
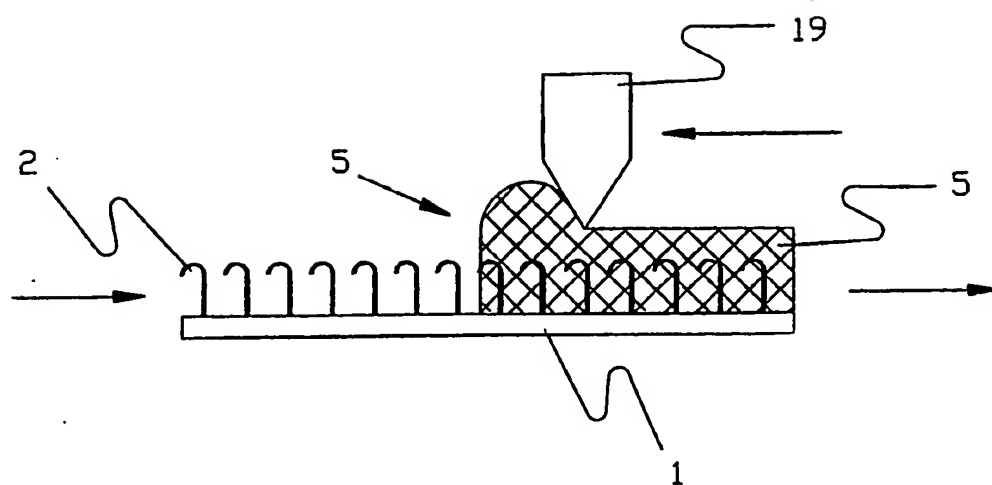
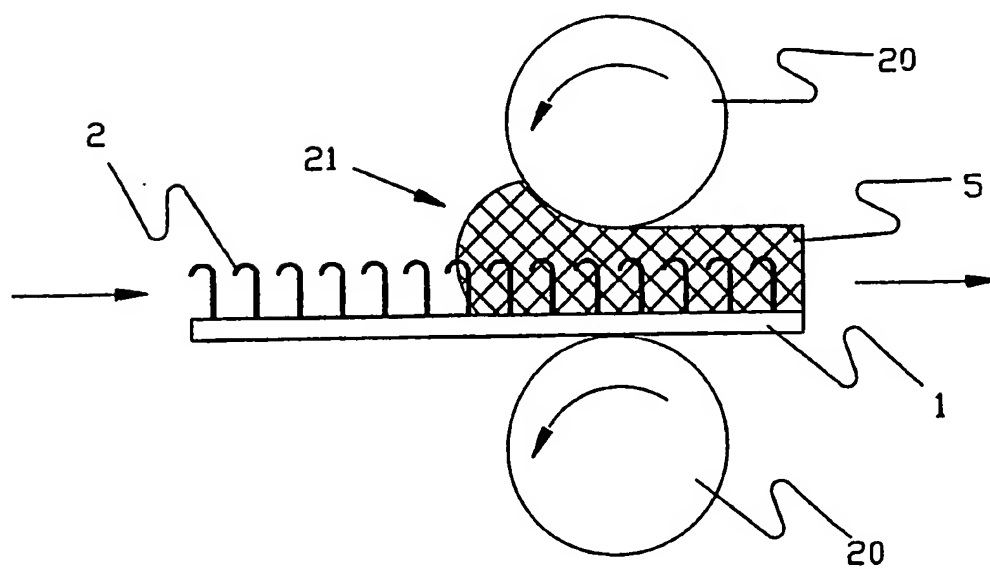


FIG. 13

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*FIG. 14**FIG. 15*

INTERNATIONAL SEARCH REPORT

PCT/US 92/02852

International Application No

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all)⁶

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 A44B18/00; B29C67/18

II. FIELDS SEARCHEDMinimum Documentation Searched⁷

Classification System

Classification Symbols

Int.Cl. 5

A44B ; B29C

Documentation Searched other than Minimum Documentation
to the Extent that such Documents are Included in the Fields Searched⁸**III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹**

Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
Y	FR,A,2 047 243 (VELCRO FRANCE) 12 March 1971 the whole document and particularly first paragraph second page ---	1-4, 7-11, 13-15,23
P,Y	EP,A,0 439 969 (VELCRO INDUSTRIES BV) 7 August 1991 see the whole document ---	1-4, 7-11, 13-15,23
A	EP,A,0 246 221 (W. KUMPF) 19 November 1987 see the whole document ---	1
A	FR,A,2 405 123 (APLIX) 4 May 1979 cited in the application see the whole document ---	1
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¹⁰ Special categories of cited documents:^{"A"} document defining the general state of the art which is not
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cited to understand the principle or theory underlying the
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cannot be considered to involve an inventive step when the
document is combined with one or more other such docu-
ments, such combination being obvious to a person skilled
in the art.^{"&"} document member of the same patent family**IV. CERTIFICATION**

Date of the Actual Completion of the International Search

20 AUGUST 1992

Date of Mailing of this International Search Report

09.09.92

International Searching Authority

EUROPEAN PATENT OFFICE

Signature of Authorized Officer

M. VANMOL

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
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**ANNEX TO THE INTERNATIONAL SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the European Patent Office EDP file on
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